REMARKS

Claims 1-22 and 23 -38 are in this application and presented for consideration. By this amendment, Applicant has amended claims 1, 2, 7, 9, 12, 17-20, 24, 26, 28, 31 and 33.

Claims 1-16 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Schönherr (US 5,321,792) in view of Achtner (US 5,788,769), Kleyer (US 5,179,622) and Portner (DE-970246).

The present invention relates to a vacuum vaporization equipment for metallizing a strip substrate. The vacuum vaporization equipment comprises a plurality of vaporization sources. Each of the vaporization sources is heated and continuously fed with a metal which is liquefied and vaporized by each of the vaporization sources respectively. Each of the vaporization sources has a body that is a monolithic structure (a one piece source body) that extends along a main longitudinal direction. This is an electrically conductive body that includes a first surface pool forming means and a second surface pool forming means for increasing the wettability of molten metal in a location. The first surface pool forming means and second surface pool forming means are a continuous conductive cross section. This conductive cross section allows the monolithic body to be connected to an electrical source with the flowing current heating each to the pool forming means of each source. A feeding means is provided for feeding the substrate over the vaporization sources along a feed direction. A continuous delivery means is provided for the delivery of metal wire to supply

each pool of the vaporization sources.

Each of the vaporization sources holds at least two pools of molten metal. Each pool is separated from the other pool by each surface pool forming means thereof, aligned along the longitudinal direction. Each of the two pools is fed by a corresponding metal wire continuously delivered by the corresponding continuous delivery means. The present invention provides the advantage of increasing the surface area of the evaporating liquid of a single body source (monolithic body with current for heating flowing therethrough). This structure increases the quantity of metal evaporated while keeping the number of heating sources unchanged (a single body being heated). The present invention also advantageously increases the uniformity of the coating deposited on the substrate. The prior art fails to provide such features or advantages.

The rejection of claim 1 as unpatentable over US '792 in view of either US '769 or US‘622 or DE‘246 and further in view of US‘538 is based on the position that it would be obvious to modify the evaporator boat teachings of Schönherr et al. (including the teachings of Elvers et al.) based on the teachings of the secondary references. The last reference has been added in the new rejection in view of the limitations relating to "each of said surface means provided for increasing the wettability of molten metal in a location".

It is asserted in the rejection that each of the secondary references US ‘769 or US ‘622 or DE ‘246 teach that a resistively heated elongated source having a plural pools of molten metal on the surface of the source will provide improved performance in comparison to a resistively heated source having one elongated pool (office action, page 2, lines 5-3 from the

bottom). The rejection implies that a combination of the primary reference with either one of the secondary references would have been obvious. However, the references as a whole fail to teach and fail to suggest important aspects of the invention.

US '622 teaches two separate and longitudinally aligned sources, each of which is provided with only one single cavity. According to Col. 1 (summary of the invention)

> "*the object underlying the present invention is to provide a series of evaporator[s] where a plurality of individual evaporators is* ***clamped in pairs between the electrical supply lines***" (emphasisadded).

Thus, this reference does not disclose individual sources, each provided with plural pools of molten metal, but rather two separate sources aligned along the longitudinal direction (machine direction).

It should also be noted that US '622 fails to teach that plural metal pools might be useful to improve performance of the vaporization device (contrary to what is asserted in the office action). This reference is simply silent as to the purpose of providing aligned elongated sources. There was no hint for the person skilled in the art to combine this secondary reference with the primary reference. It should be noted also that the purpose of the present invention is to improve the efficiency of the vaporization boat by increasing the overall vaporization area, i.e. the surface of the molten metal. See the specification, page 3, lines 23-25. This is done by subdividing the evaporation source into two or more pools of molten metal, because this increases the overall wetted surface. US '622 is not based on the same approach, since it simply suggests to align two evaporation boats, each of which is provided with a single metal

wire feeding and on which a single pool of molten metal is generated.

Applicant has clarified that the invention is a boat or source of a monolithic body, namely the vaporization source is made of a monolithic structure with current flowing therethrough, namely through the two pool forming structures. The monolithic structure has the first and second surface means provided thereon to define the two pools of molten metal.

US '769 addresses the problem of improving coating by providing the trough-shaped part of a common vaporization source with openings such as vertical holes longitudinally in front of and/or behind the area wetted by molten metal. The purpose of these holes is to reduce the cross sectional area and thus increase ohmic heating in that area and reducing heat dissipation (See Summary of the Invention). Again, there is no hint for the person skilled in the art to combine the teachings of the primary reference and this secondary reference. Placing holes in the source body, to lessen the surface area, dose not suggest the combination of features claimed. To the contrary, since the secondary reference (as discussed in connection with a previous office action) does not suggest to use continuous metal wire feeding as provided by the primary reference and by the claim.

US '769 suggests providing very small vaporization areas on the vaporization source, these areas being separated by holes. The purpose of such an arrangement is to have uniform heating by ohmic effect. The purpose of the present invention is to increase vaporization by keeping uniform deposition on the film. This is achieved by providing two or more pools of molten metal along the vaporization source because

"in this way the surface of the molten metal present in the vaporization source

is physically subdivided into two parts. As a consequence more uniform filling of the two cavities is achieved, with the consequent formation of large evaporating surfaces" (see page 3, lines 23-26 of the specification).

This is to some extent an approach opposite to the one of US '769: the reference requires subdividing the metal into very small zones each separated by an empty space where holes 12 are provided for the purpose of increasing heat generation. The result is a very small vaporization area. The present invention provides for subsequently arranged pools of metal to increase the vaporization area on the same vaporization boat (monolithic body). Further, according to amended claim 1 a continuous conductive cross section of the vaporization source is maintained. This is clearly not the case in US '769, the core teaching of which is essentially the introduction of discontinuities in the conductive cross-section of the source (holes 12,12', 12", 12'").

DE '246 teaches transversely arranged evaporation sources, wherein pools of molten metal are aligned transversely, i.e. in the cross-direction rather than in the machine direction. Figs 1-5 and 7 clearly disclose that the arrangement is transverse to the advancement direction of the web – see also specification page 3 last paragraph (of the English translation). Fig.6 discloses an arrangement of pools wherein the pools are again aligned transversely. Since the web moves in a direction orthogonal to the pool alignment, in order to increase uniformity of the deposition two rows of staggered pools are provided. However, only one source with one or two rows of transversely aligned pools is provided, rather than a set of vaporization sources aligned transversely to the web feeding direction and each provided with pools of molten metal

aligned along the respective longitudinal direction. The problem underlying the secondary reference is (similarly to what has been discussed with respect to US '769) introducing discontinuities to achieve uniform heating. The discontinuities are in the conducting material forming the vaporization sources (see cuts c, d, g in the drawings and claim 1). Again, there is no hint in the secondary reference to improve vapor deposition efficiency by increasing the molten metal surface as set forth in the claims. A combination of the primary reference and the secondary reference DE '246 would not have been obvious because the structure of the vaporization sources in the two references is inconsistent with one another and because there was no hint to do so, since the two references are concerned with different problems and based on different approaches. Also in claim 1 a continuous conductive cross section of the vaporization source is maintained. This is clearly not the case in DE '246, the core teaching of which is essentially the introduction of discontinuities in the conductive cross-section of the source (cuts c or d).

The combination of the secondary references with the primary reference was either non-obvious and/or would not have resulted in the claimed invention. Further the secondary reference US '538 (Alexander) is also not obviously combinable with the primary reference and/or either one of the three secondary references discussed above (US '769 or U5'622 or DE'246).

The teachings of US '538 relate to machining the bottom of one single pool in order to increase wettability and to generate a more uniform layer of molten metal in the pool. There is no hint for the person skilled in the art to use this way of increasing wettability in an attempt

to generate a plurality of separately arranged pools on the same vaporization source. The claim requires that each of the surface pool forming means is provided for increasing wettability and that two surface means are provided spaced apart from one another. The secondary reference US '538 teaches that the whole bottom of the pool must be provided with a single surface means to improve wettability on the one and single area defined by the bottom of the pool.

Claim 13 has been rejected as being obvious over the above discussed references and Anderson (US '529). However, the subject matter of claim 13 is patentable for the same reasons as noted above.

Claim 17- 20 and 23 - 27 have been rejected as being obvious over US'769 in view of US '538. It is believed that claims 17 and 19 and the various dependent claims patentably define over the prior art for several reasons:

Claim 17 requires that a "*continuous conductive cross section*" is provided. US '769 fails to teach this feature, since the very purpose of the primary reference is just to introduce discontinuities in the cross section of the vaporization source. Thus, even if combined with the secondary reference, the prior a would not have suggested the claimed invention.

Furthermore, the secondary reference teaches introducing shallow grooves on the entire surface of the pool forming structure. This teaching, if combined to US '769 would have resulted in the bottom of pool 14 of US '769 being entirely grooved with a uniform wettability thereof. There is no hint in either the primary or secondary reference to use grooves on the vaporization surface to generate separate pools of molten metal. The prior art references fail

to fairly suggest to the person skilled in the art to use locally applied grooves as disclosed in US '538 to only locally increase wettability and thus provide a vaporization source where separate molten metal pools are maintained by differential wettability properties of the surface. There is no hint in either the primary reference or the secondary reference to provide surface means "*for increasing wettability of molten metal in a location thereon*", as in claim 17 wherein differential wettability properties are used to keep molten metal pools separate on the same source.

Claim 28 has been rejected as being unpatentable over US '032 in view of JP '157 (or US '792) and further in view of US '769 or US '622 or DE '246.

The rejection is again based on one of the secondary references teaching having plural pools of molten metal on the surface of each source. As noted above, these features are not taught by the secondary references. Further, claim 28 specifically requires that the sources are aligned crosswise. DE '246 clearly teaches a single vaporization source extending transversely to the substrate feeding direction, which is inconsistent with the teaching of the primary reference and to claim 1. US '622 discloses pairs of sources aligned longitudinally, rather than a monolithic source having two pools thereon. US '769 fails to teach uniform cross-section.

Applicant respectfully requests that the rejections be reconsidered in view of the claims as now resented and the discussion above.

Favorable action on the merits is requested.

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